ROLE OF CONTINUOUS ANTIBIOTIC PERITONEAL LAVAGE IN POST-OPERATIVE CASES OF INFECTIVE PERITONITIS

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C E R T I F I C A T E

Certified that the work entitled " ROLE OF CONTINUOUS ANTIBIOTIC PERITONEAL LAVAGE IN POST OPERATIVE CASES OF INFECTIVE PERITONITIS " has been carried out by Dr. Pankaj Gupta himself in this department.

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Pankaj Gupta

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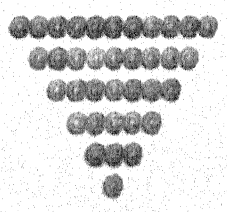

INTRODUCTION

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The basic aim of medicine and science has always been to alleviate human pain and suffering so as to give a better and longer life. Over the years the art of medicine has under gone revolutionary changes due to the tireless efforts of countless ancient and modern men. Discovery of new drugs, newer techniques to correct the deficiencies of the past have helped in making medical science reach the pinnacle at which it rests now. Even then, the efforts to further spur on the development of medicine is going on.

Infective peritonitis is one such disease which still causes much sufferings and death, despite the advances of medicine. Efforts to conquer this disease have been going on for nearly a century.

Infective peritonitis is a problem which continues to kill half of the patients so afflicted. Artz et al (1962) over a period of five years found that there were 20 deaths out of 58 cases (34.5%). Altemeier and Cole (1956) reported that more than 50% of their patients in a state of septic shock had diffuse peritonitis. Stephen and Lowenthal (1978) reported a mortality rate of 48% from generalized infective peritonitis.

Significant morbidity has been seen in cases of infective peritonitis. Subsequent complications in the form

of septicemia, faecal fistulas and burst abdomen are very common. The reason for the mortality is readily appreciated when one realises that diffuse peritonitis involves a mesothelial surface of 22,000 square cm. and is equivalent to a 75 to 100% body surface area.

Infective peritonitis generally runs a fulminating course, A profound toxicity usually ensues with extensive inflammation of the peritoneum. The lipopolysaccharide component of the walls of the gram negative bacilli accounts for a good deal of this toxicity. According to Davis (1967) cellular destruction results in the release of numerous vasoactive amines, which have a profound local and systemic effect. Severe peritonitis is also associated with severe fluids and electrolyte imbalance.

Despite better surgical techniques in controlling the contaminating source (perforation, gangrene, anastomotic breakdowns), better antibiotics and supportive therapy a significantly high mortality as stated earlier persists. Most patients die after a protracted course -mean survival time being 4 weeks. The cause of death being multisystem failure secondary to continuing intraperitoneal sepsis.

In our country the morbidity and mortality due to infective peritonitis is quite high. In presence of pus in the peritoneal cavity, antibiotics given parentraly

cannot reach the site of contamination in appropriate levels. By peritoneal lavage the antibiotics are made available in solution form and in high concentrations in the peritoneal cavity. Thus they can also act locally at the site of contamination. Just as debridement plays a major role in the management of surface wounds and burns so also mechanical cleansing by continuous peritoneal lavage, may be expected to benefit the large inflammed peritoneal surface.

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REVIEW OF LITERATURE

REVIEW OF LITERATURE

The concept of mechanical cleansing of the peritoneal cavity using lavage is not new, being first advocated for use at the time of operation by Nolan (1893) and by Price (1905).

Price in 1905, managed to reduce the mortality in peritonitis by more than half by performing peritoneal lavage at the time of operation. He opened the abdomen and after dealing with the contaminating source (perforation, gangrene or leaking anastomosis) poured litres of sterile water to wash away all pus and debris. Following this he closed the abdomen without putting in any drain. He concluded that lavage was a good method but sterile water was preferable to saline.

Silvani et al demonstrated that intrapetitoneal administration of streptomycin effectively sterilised the peritoneal cavity of dogs with fulminating diffuse peritonitis of appendiceal origin; whereas intramuscular administration did not significantly alter the bacterial flora of the peritoneal exudate. This study was done in 1974.

Zintel et al (1950) afterconducting studies on experimentally produced peritonitis in dogs concluded that

penicillin therapy alone over a period of 10 days was as effective as a combination of penicillin and streptomycine.

Reiss et al (1952) in a study of 68 patients treated with terramycin belived that this was a good antibiotic agent, but the combined use of penicillin and streptomycin had real merit.

Barbieri et al (1953) traced the influence of parenteral Aureomycin, Chloromycitin, Terramycin and Procaine Penicillin on the mortality of experimental peritonitis. They found that these broad spectrum antibiotics lowered the mortality rate but were more effective when combined with large doses of penicillin.

Schatter and Abbott (1953) produced experimental appendiceal peritonitis in dogs. When the dogs were treated with intravenous Terramycin the mortality was 100% but when treated with intraperitoneal terramycin the rate came down to 41%.

Kelley and Vest (1952) have shown that lavage of the peritoneum with a balanced salt solution rapidly restores the metabolic drrangements (fluid and electrolyte) imbalance, acid base imbalance) to normal.

Burnet et al (1957) by extensive experiments on guineapigs came to the conclusion that :

1. If there is no complication and peritonitis is the only cause of the patients illness, the method of

removing the cause, lavaging the peritoneum free of removable foreign matter with large quantities of saline containing antibiotics and administering antibiotics systemetically is the best method of treatment.

ii) Lavage with saline alone is as good ar slightly better than instillation of antibiotic alone.

This agrees with the logic on which this combined procedure was developed.

a. The basic surgical principal of removal or neutralisation of the cause is applied.

b. Lavage removes large quantities of toxins from a great absorptive area and many bacteria which would otherwise have to be dealt with the body defences. Enzymes are removed from further harm to the reparative process.

Chemical irritants and diagestive enzymes leaking from ruptured peptic ulcers are removed. All surfaces are exposed to antibiotic solution which can be delivered in concentrations unattainable by systemic administration. With as little as 100,000 units of penicillin in a litre of saline, 100 units per ml are available, while the same amounts given intravenous would deliver only 4 units/ml per hour and intramuscular only 2 ml per hour.

The method is to obtain exposure adequate to thoroughly lavage the peritoneum using a solution of penicillin 1,00,000 units and streptomycin one gram per 500 ml. Next is to remove or neutralise the cause of contami-

nation. All adhesions and barriers are broken down gently to destroy any hiding pockets for bacteria so that all surfaces can be bathed in antibiotic solution.

This procedure has also been found useful in:
1. Rarely when gross contamination occurs during operation.
2. In patients with severe peritonitis brough in after shock has begun who cannot withstand formal operation. They can be helped over the critical period by inserting drains under local anaesthesia and after aspirating the purelant material and lavaging the peritoneal cavity. This greatly decreases the sepsis and a definitive operation can be done lateron when the patient's condition improves.

They thus summarised that in the treatment of peritonitis clinical and laboratory evidence indicates that, the addition of peritoneal lavage with high concentration appropriate antibiotics in saline combined with the basic principles of good surgery and the systemic administration of antibiotics offered the patient a much better chance to recover and has few if any ill effects.

Altermeier and Cole (1956) reporting on the morbidity of peritonitis found that more than 50% of their patients in a state of septic shock had diffuse peritonitis.

Schveinberg et al (1957) found by experiments on dogs in which peritonitis was produced experimentally that the cure rate by giving Aureomycin intreperitoneally was 80%. They said that Aureomycin should not be given for

more than 48 hours intraperitoneally or it may produce chemical peritonitis which could be fatal.

Barnett and Hardy (1958) demonstrated the value of irrigation of the peritoneal cavity in strangulated intestinal obstruction. Very conclusive evidence was provided for the value of early irrigation of the peritoneal cavity with saline in experimental peritonitis.

Barnett (1960) found the intraperitoneal route of administration of antibiotics superior than other routes of administration in strangulation obstruction.

Silaer (1960) reported that he treated faecal peritonitis with lavage by a mixture of penicillin and streptomycin in 0.25% procaine (200 ml). He found no toxicity due to the drugs and an improved survival rate.

Barret (1961) used Neomycin intraperitoneally and improved survival rate. Long term toxicity studies should pathological changes at the highest dose (1.0gm/kg) body weight only with inflammatory changes in liver and lung. For all practical purposes it does not reduce adhesions.

Artz et al (1962) carried out an experiment in which standardized faecal suspension was injected into the peritoneal cavity of dogs and various treatment regimens were evaluated. They found that -

i. In the majority of animals bacteria were not detected in the blood stream during the first two hours after injection of faecal suspension. Microorganisms began invading at the 3rd hour and increased in number until the animals died usually between 7th and 9th hours.

ii. Penicillin produced a 55% survival whilst a combination of penicillin and kanamycin produced 100% survival rates while kanamycin alone produced a 60% survival.

iii. Various antibiotic combination did not produce a significant difference.

iv. If the antibiotic combination is injected immediately after the faecal suspension is given the route of administration makes little difference. If peritonitis is allowed to develope with a delay of two hours between injection and the administration of the antibiotic combination it is evident that intravenous and intraperitoneal route is better than intramuscular route.

v. After irrigation of peritoneal cavity 85% animals survived in comparison to 45% survival in control group. Thus they concluded that a combination of penicillin and kanamycin produced significantly more survival than either antibiotic used alone. Early irrigation of the peritoneal cavity with saline combined with antibiotic therapy gave significantly superior results to antibiotics therapy alone.

Goligher J.F.(1957) Brown et al (1960) Dawson et al (1965) found that in diverticulitis of the colon complicated by perforation or intestinal obstruction, conservative surgery in the form of colostomy and drainage of the peritoneum was the best method.

Cohn and Cotlar (1962) found that intraperitoneal kanamycin administration significantly reduced the mortality in experimental peritonitis in dogs. Kanamycin was used intraperitoneal 1 gm dissolved in 50 cc of normal saline. No toxicity was seen. The incidence of complication was decreased. They advocated wider usage of intraperitoneal kanamycin when in traperitoneal antibiotic therapy is indicated.

Schumer et al (1964) produced peritonitis experimentally in dogs and guinea pigs by resecting the tip of the appendix so that the lumen was open to the peritoneal cavity thus producing a mortality of 95-100%. They found the use of antibiotics and hypothermic lavage irrigation statistically significant regarding the protection of the guinea pig and dog from the ravages of late peritonitis. Guinea pig mortality was reduced from 100 to 10 percent and dog mortality from 95 to 40%.

Cohn and Cottar supported the value of operative peritoneal lavage with antibiotic solution. They reduced mortality from 68-28%. This work was done in 1962.

Burns, Henderson and Merrill (1962) noticed that in peritonitis peritoneal dialysis reduced sepsis. They also reported perforated duodenal ulcers with severe chemical peritonitis which were also relived by peritoneal dialysis.

The studies by Thal (1963) on the venous effluent from the inflammed pancreas correlated the level of the vasoactive polypeptides with the systemic manifestations of this disease.

Wall (1965) suggested that most of the toxic substances in peritonitis were water soluble and dialyzable and readily removed by lavage. The removal of these substances together with gross post-operative debris and bacteria is the first major benefit of lavage.

Davis (1967) reiterated that cellular destruction in cases of peritonitis results in the release of numerous vasoactive amines which have a profound local and systemic effect.

Mackfanna et al (1970) carried out a study on the use of continuous post operative peritoneal lavage in the management of diffuse peritonitis. In their study two groups of patients corresponding in age and pathologic condition were studied over a three years period. Each matched group consisted of 25 patients. The first group received conventional management in the form of supportive

fluid and electrolyte therapy, antibiotics, supportive drugs, such as digitalis and laparotomy with definitive surgical management of the precipitating lesion when indicated. A review of 25 patients treated by conventional means revealed a mortality rate of over 50% in addition to a significant morbidity rate. In the second group of 25 patients was managed in essentially the same manner except that at the conclusion of the laprotomy and definitive surgical management, cannulas and drains were inserted, and lavage was instituted.

Their techniques was after removal of gross detritus, the peritonealcavity was irrigated with 1-4 litres of a balanced salt solution. Through 4 quadrants stab wounds, two infusion cannulas were inserted in the upper quadrants and 2 large sump drains in the lower quadrants. The two upper cannulae were positioned in the recess of the subdiaphragmatic regions. One of the lower drain was positioned in the pelvic, region and the other along w paracolic gutter.

Post operative lavage was begun through the upper cannulae with a balanced salt solution containing antibiotics 25 mg of kanamycin and 1 million units of penicillin was placed in alternate litres. The volume of fluid infused varied with the type of inflammation and the amount of the detritus present. In the first 8 hours upto 16 litres of this solution, was used. The lavage was continued until the per fusate returned clear.Serial samples of the solution were

taken at frequent intervals for examination of turbidity, electrolyte, and protein content; colony counts, and culture and sensitivity studies. Apart from peritoneal lavage, conventional principles of post operative management for all these critically ill patients were followed.

The average quantity of solution used during operative procedure was 2 litres. In the first 8 post operative hours an average of 8 litres was used. Lavage was continued for an average of 48 hours and an average of 24 litres was used per patient.

Peritoneography was done to assess the adequacy of perfusion of the peritoneal cavity in 5 patients. 100cc of conray 60 were added to the lavage solution and rapid dispersion was found from the site of infusion in the midumlical region to all the recesses of the peritoneal cavity.

A comparison was made of the complications in each of the two groups of matched pair of patients.The total number of patients in each group was 25. The average age of the patients in conventionally treated group was 71 years as compared to an average age of 73 years for those receiving post operative lavage. 15 deaths, six intra abdominal abscesses, six wound abscessess, and 3 wound disruptions were encountered in the control group as compared to 5 deaths, one intra-abdominal abscess, 2 wound abscesses in the latter group. No wound disruptions were found in the latter group. In the

second group 5 patients treated with lavage died from problems unrelated to the lavage.

They summarised that post operated intra-peritoneal lavage helps restore homeostasis in patients with peritonitis by performing an efficeint aqueous debri-dment, by restoring normal fluid and electrolyte balance, by correcting abnormalities in the acid base state, by removal of vasoactive amines specially in peritonitis associated with severe pancreatic necrosis and finally by helping to prevent severe protein and fat catabolism.

They suggest that a rational approach to the problem of diffuse peritonitis is to eliminate the cause and to utilize operative and early post operative continuous peritoneal lavage with copious quantities of a balanced salt solution containing kanamycin and penicillin.

They found that this technique reduced the mortality rate from severe peritonitis by 40% and the morbidity rate by 50% in a group of 25 patients.

Brown et al (1970) advocated the use of intra-peritoneal noxythiolin in faecal peritonitis. Noxythiolin is a simple chemical compound which undergoes slow decomposition and liberates free formaldehyde. It is relatively non toxic when given intraperitoneally to animals and has a high thera-peutic rate. When a lethal gram negative peritonitis was induced in guinea pig with proteus and coliform organisms,

intraperitoneal injection of noxythiolin offered a significant protection. In humans with faecal peritonitis the use of noxythiolin intraperitoneally reduces the mortality and morbidity of the condition.

Noxythiolin is chemically oxymethyline methylthiourea and in solution undergoes slow decomposition to liberate free formaldehyde, the reaction being accelerated by the addition of heat.

$CH_3NH \quad CS \quad NH \quad CH_2Ch = CH_3NH \quad CS \quad NH_2 + HCHO$

Since formaldehyde is toxic the solutions must be prepared fresh and are not suitable for autoclaving. Drug is soluble in water, a 3.6% solution being isotonic. The use of this compound was previously limited to surface application and bladder irrigation. It is not suitable for systemic use.

In all cases of severe peritonitis noxythiolin has been used by the author. Those cases in which faecal contamination was present were also included. 23 cases were treated. The routine treatment was to control the causative lesion (in most cases this demanded a proximal colostomy), peritoneal toilet and instillation of 2.5 to 5.0 gms noxythiolin in 100 ml of distilled water into the peritoneal cavity before closing the wounds. Most cases were also given broad spectrum antibiotics and supportive treatment in form of blood transfusion, fluid and electrolytes and cortisone as demanded by

the patient's condition. Only 3 deaths occured - a mortality of 13%. Two were due to massive pulmonary embolism and after resolution of pulmonary condition, the deaths was due to multiple residual abscesses. It was thus suggested by the authors that this simple substance noxythiolin is a useful addition in the therapeutic armamentarium in all cases of peritonitis.

Stephen et al (1978) found a mortality of almost 50% from generalised infective peritonitis. A worsened prognosis could be predicted by several factors assessed preoperatively. The usual cause of death was continuing intraperitoneal sepsis. This was manifest as multisystem failure in an intensive care environment.

Wakely and Hunter (1977) after a clinical trial recommended the use of operative lavage for peritonitis associated with pancreatic necrosis.

Stephen and Lownthal (1979) carried out a study on continuing peritoneal lavage in high risk peritonitis.

Twentynine patients with peritonitis were selected for lavage over a period from 1975 to 1977. The criteria for selection were either hypotension (Blood pressure less than 100 mm Hg) multisystem failure with multiple intraperitoneal abscesses, the presence of intreperitoneal faeces or anastomotic breakdown.

All patients were operated upon in an attempt to control the contaminating source. The peritoneal cavity was cleared both mechanically and by repeated saline washing. The first operative lavage contained the some antibiotics as the post operative dialysis fluid. A minimum of 3 large portex drains were inserted in the hepatorenal pouch, the subsplenic area and the pelvic cavity.

After operation patients were treated with parenteral gentamycin, cepalothin sodium and lincomycin.The major benefit was in those patients in whom there was greatest peritoneal contamination. This fits in well with the concept that lavage produces a continual cleansing action of recurring residual debris left after operative washing.

The antibiotic combination was chosen as it was shown to be effective in treating thegram negative, the gram positive and aerobic organisms. The lavage consisted of 1.5% Dianeal solution as used for peritoneal dialysis. To each litre was added 3.5 m. mole of pottassium chloride, 10 mg of gentamycin, 30 mg of lincomycin and 50 mg of cepalothin. One hour cycles of one litre were used.

For 5 minutes the solution was run in through a blood warmer, retained for 30 minutes and frained out over 25 minutes. Each drain was used exclusively for 6 cycles. The other being temporarily spigoted, progressively using each in clockwise direction. After 72 hours the lavage was ceased.The

drains were left in situ for another 24 hours and removed if no significant fluid was issuing.

Of 27 patients treated six deaths occured. The age of the patients was not significantly different from the same author's study in 1970-75. There was a significant decrease in the mortality rate, which was 21.6% whilst in the previous study the mortality was nearly 50%.

The relationship between cause of peritonitis is highlighted by the striking difference which occured in those patients with gross intraperitoneal contamination, anastomotic breakdown with widespread spillage, or multiple intraperitoneal abscess was highly significantly improved using lavage. There was no significant difference in the survival rates in patients with lesser degrees of contamination.

Six lavage treated patients died. Four diedf from continuing peritoneal contqmination due to multiple bowel perforation from ischaemic gut and three cases from an uncontrollable fistula in the other. Two other patients had no peritoneal sepsis at the time of death. No death was attributed to antibiotic toxicity.

The higher rate of survival for those patients treated with continuing lavage compared favourably with those managed conventionally. This occured exclusively in high risk patients known to have poor prognosis. But they said that the use of peritoneal lavage would not be undertaken lightly. It requires careful monitoring of the fluid balance.

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DRUGS

D R U G S

It would be proper to review the biological activity of some of the drugs that have been used in various studies so far including those in the present study.

Lincomycin

Lincomycin is an antibiotic elaborated by an actinomcete, Streptomyces lincolnensis. Lincomycin is a derivative of the aminoacid trans - L-4-n-propylhygrinic acid, attached to a derivative of an octose plus a sulfur atom.

Concentrations of Lincomycin of less than 0.5 microgram/ml inhibit the multiplication in vitro of K. pneumoniae, Group A strep. pyogenes, Strep. viridans and B. anthracis. C. diphtheriae, Cl. tetani and cl. perfringens are suppressed by concentrations lower then 2 microgram/ml. Susceptibility of Staph. aureus to drug is variable; while most strains are sensitive to about 2 microgram/ml, about 15% of strains grow in a concentration of 5 microgram/ml. The antibiotic is highly active against most types of Bacterioids and others anaerobes. Lincomycin is not inhibitory for most strains of N.Gonorrhoeae, H. influenzae and Enterococci, Gram negative Cocci, viruses and fungi are resistant.

Lincomycin binds exclusively to the 50 S subunits of ribosomes and suppresses the bacterial protein formation by inhibiting peptide bondaynthesis. Erythromycin

can reverse the inhibition produced by lincomycin probably reacting on the same site of ribosome, the activity of lincomycin is blocked even if bacterium is sensitive to it.

Lincomycin is repidly but partially absorbed from gastrointestinal tract. Peak plasma concentrations average about 2-5 microgram/ml after an oral dose of 500 mg and detectable antibacterial activity persists for 12 hours or more.

Intramuscular injection results in maximal plasma level within 30 minutes. With 600 mg intramuscularly every 12 hours, maximal plasma levels are 15-20 microgram/ml. Intravenous infusion over a 2 hours period of 600 mg of drug produces concentrations in therapeutic range for 14 hours. The biological half life after oral, intramuscular, or intravenous administration is about 5-6 hours. In patients with hepatic insufficiency half life of drug is most doubled, even when renal function is normal.

Lincomycin is distributed in both extracellular and intracellular fluids and is detectable in most human tissues.

Oral administration of lincomycin can cause Glossitis, Stomatitis, Nausea, Vomiting, Enterocolitis, Pruritis ani, Vaginitis, Urticaria. Parentral administration has been followed rarely by neutropenia, Leuocopenia and Thrombopenia all of which disappear when therapy is stopped. Elevation of serum Glutamic Oxaloscetate trans-

aminase have occasionally been observed after Lincomycin, but in some cases there is a false reaction.

Lincomycin hydrochloride, U.S.P.(Lincocin) is available in Tablets and capsules containing 250 to 500mg and as a sterile solution (300 mg/ml) for parentral use.

(Goodman and Gilman)

Kanamycin

Kanamycin is an antibiotic produced by Streptomyces kanamyceticus. Kanamycin is a polybasic water soluble substance. It contains two aminosugars linked Glycosidically to 2 deoxysterptamine. Kanamycin resembles neomycin and has some chemical similarity to Streptomycin.

Kanamycin has a broad range of activity against Gram positive and Gram negative microorganisms. Sensitive bacteria include E.coli, A aerogenes, K. Pneumoniae, proteus species the paracolon group, Salmonella, Shigella, Vibrio, Neisseria, Brucella, M. tuberculosis, atypical mycobacteria and staph. aureus. Resistant Micro-organisms include pseudomonas, Enterococci, Bacteroides, Clostridia and other anaerobes, strep. viridans, coccidioide, Yeast and fungi. The levels of kanamycin required to produce bacteriostatic andd bactericidal effects are not greatly different. As kanamycin has been used more extensively resistant strains of stapy. aureus (up to 30% in some hospitals) K.pneumoniae, Proteus, Aerobacter, E. coli Salmonella, Shigella and

Paracolon group have been isolated from infected patients.

Kanamycin is poorly absorbed from the gastro-intestinal tract, and most of an ingested dose is eliminated in the faeces, very low plasma concentrations are detectable, after oral medication in some individuals. Intramuscular injection of one gram of kanamycin yields a peak plasma level of 20-35 microgram/ml at about one hour; and falls to 1.2 microgram/ml or less at 12 hours. The level of kanamycin in blood is higher in older individuals. Excessive concentrations develop in patients with renal insufficiency. Kanamycin is not bount to plasma proteins. Repeated injections do not lead to accumulation in the blood if renal function is normal. Parentral administration of kanamycin results in the appearance of appreciable concentrations of drug in pleural, aspitic, synovial, and peritoneal fluids. The antibiotic diffuses poorly into bile, faeces and amniotic and prostatic fluid.

Kanamycin sulfate, U.S.P.(KANTREX), is available as an injectible solution in vials containing 500 miligram in a two ml. or 1.0 gm in a 3 ml volume, in paediatric vials (75 mg/2 ml), and for oral use in capsules containing 0.5gms.

Among the hypersensitivity reactions that have been noted in individuals receiving kanamycin parenterally are eosinophilia, fever, maculopapular rashes, pruritus and anaphylaxis. The most important side effects of kanamycin

stem from its ototoxicity and nephrotoxicity. Both the cochlear and vestibular portions of the auditory nerve may be damaged. Conversational hearing loss may be prevented by omitting the drug as soon as any evidence of autitory injury is manifest; this requires frequent audiometric study. Neurotoxicity of kanamycin is a curare like effect on neuromascular junctions. Paralysis of respiration reveresed by neostigmine may occur when the antibiotic is instilled into the peritoneal cavity immediately after abdominal surgery, especially when a neuromuscular blocking drug has been administered.

Gentamycin

Gentamycin is a broad spectrum antibiotic derived from Micromonospora purpurea, Gentamycin consists of three closely related components - Gentamycins C_1, C_2 and C_{12} - with very similar molecular weights. Structural formulae of the gentamycin components have not yet been established. The drug is water soluble and stable to heat and to a wide range of pH.

The three components of gentamycin have nearly identical antimicrobial activity in vitro. Despite disperate reports, it is generally agreed that about 95% of pseud. aeruginosa are inhibited by 10 microgram/ml or less of the drug. E.coli, Klebscilla andaerobacter are also highly sensitive. Practically all penicillin sensitive and some methicillin resistant strains of staph. aureus are suppre-

ssed by a concentration of 5 microgram/ml or less. Group A streptococci, D.pneumoniae, past. mjltocida, H. influenzae, and bacteroids are reasonably sensitive to gentamycin. Mycobacterium tuberculosis and mycoplasma pneumoniae are highly sensitive. Neisseria gonorrhoeae and N. meningitidis and corynebacteria are relatively resistant, the drug is bactericidal in concentrations 2-3 times those required to produce bacteriostasis.

Gentamycin is not absorbed to as significant degree from the gastrointestinal tract. Single oral dose upto 1.5 gram in man are absorbed only to the extent of about 0.2%. Intramuscular injection of gentamycin sulfate in a dose of 0.4 mg/kg produces a peak plasma level of about 1.5-3 microgram/ml at 1 hour. The half life of gentamycin is about 4 hours in individuals with essentially normal glomerular filtration rates; in patients with uraemia, the drug accumulates in body and its half life may be as long as 45 hours.

Approximately 30% of antibiotic is bound to plasma proteins. Gentamycinis excreted by glomerular filtration; Little, if any, of the drug undergoes tubular secretions or reabsorption. Concentration of the gentamycin in urine may be 50 -100 times higher than those simultaneously present in the blood. The drug diffuses into pleural and peritoneal fluid.

The official preparation is gentamycin sulfate, U.S.P.(Garramycin sulfate). It is available in 2 ml vials containing sterile solution of 40 mg/ml.

Among the untoward reactions to gentamycin are nausea, vomiting, headache, transient proteinuria, elevation of blood urea, nitrogen, increase in serum transaminase and alkaline phosphatase, and transient macular skin erruptions. The most important untoward effect of gentamycin involves the VIIIth cranial nerve. Ototoxicity appears in about 1% patients, vestibular function is injured to a greater extent than hearing. It may be very severe, and function may be lost completely. Gentamycin should not be administered to pregnant women (Goodman and Gilman).

Streptomycin

Streptomycin is one of the aminoglycosidic antibiotics and is N-methyl-L-glucosaminidostreptosidestreptidine. The drug is made up of the three components streptidine, streptose, and N-methyl-L-glucosamine; streptomycin base and its inorganic acid salts are soluble in water. It remains stable in the dry state at room temperature for atleast 1 year.

High concentrations of streptomycin are bactericidal whereas low concentrations are bacteriostatic in vitro. Very low concentrations of streptomycin may stimulate bacterial growth. The microorganisms that are sensitive to concentrations of streptomycin readily attainable in man

are Brucella, Erysipilothris, Hemophilus ducreyi, listeria monocytogenes, Actinobacillus mallei, Nocardia, Pasteurella pestis and tularensis, many but not all strains of Mycobacterium tuberculosis and Shigella. The species with stains exhibiting a wide variation in susceptibility include Diplococcus pneumoniae, S.typhosa and other Salmonella, E.coli, H. influenzae, the gonococcus and the meningococcus, proteus vulgaris, staphy. aureus and albus, Strepto. pyogenes Group A, strep. faecalis, strep. viridans, and vibrio comma. Bacteroides, Clostridium, Rickettsia, Candida, Histoplasma, and Entamoeba histolytica, Trichomonas vaginalis and all viruses are totally resistant to streptomycin.

Orally administered streptomycin is poorly absorbed from the gastrointestinal tract but is not inactivated therein. As a result, the enteric flora is markedly suppressed.

Streptomycin acts directly on the ribosome where it inhibits protein biosynthesis and decreases the fidelity of translation of the genetic code. A major disadvantage of streptomycin therapy is the development of bacterial resistance to the drug.

Very little streptomycin is absorbed from the intestinal tract. Instillation of 0.5 gm intrapleural results in rapid absorption of streptomycin into the blood.

Streptomycinis absorbed very well and rapidly from intramuscular and subcutaneous sites, and is distributed in blood and plasma, and also in the extra cellular fluids. It enters the peritoneal fluid readily from the circulation plasma and peritoneal levels are about equal in the presence of peritonitis.

Streptomycin is excreted by glomerular filtration. The half life of antibiotic as 2-4 hours in normal adults and increases to 100 hours when blood urea nitrogen values are in the range of 100-150 mg/100 ml. Streptomycin sulfate U.S.P. is supplied for parenteral injection in a vial containing 1 or .5 grams of the base.

Side effects are hypersensitivity reactions, drug fever and Labyrinthine damage (Goodman and Gilman).

Benzylpenicillin

Benzylpenicillin (penicillin G) is an unstable acid but its sodium or potassium salt (soluble or crystalline penicillin) is stable when dry. It is readily soluble in water butthe solution is unstable, its activity being slowly lost even at 4°C.

Because of its almost complete lack of toxicity in patients who show no hypersenitivity to it, penicillin can usually be given, if necessary, in very large doses. It is active against almost all the Gram positive and

some of the gram negative organisms. Sensitive organisms include the streptococci, staphylococci, gonococci, pneumococci, meningococci, the spirochaetes, the actinomyces and the large viruses. In clinical terms this means that the range of conditions likely to respond to penicillin therapy includes wound sepsis, cellulitis, peurperal sepsis, bacterial endocarditis, pneumonia, syphilis, gonorrhoea and some infections of the skin, the eye and the throat. Penicillin may also be used to provide an antibiotic umbrella to prevent the accumulation of micro-organisms in the blood (bacteraemia) following the femoval of infected teeth or tonsils from patients with valvular heart disease.

Some strains of some of the bacterial species listed as penicillin sensitive are resistant to the drug and their numbers have increased with the years as the sensitive strains have succumbed. This is particularly true tof Staphylococcus aureus. Many resistant strains of gonococcus have also appeared.

General Properties - Benzylpenicillin is active when taken by mouth but no more than one-third of the amount ingested reaches the blood stream and absorption is still further reduced if food is present in the stomach orr duodenum. The unabsorbed penicillin is excreted in the faces. Benzylpenicillin is unstablein acid and some destruction may take place in the stomach.

Benzylpenicillin is absorbed largely from the duodenum. It is secreted by the renal tubules. Consequently it is very rapidly eliminated from the body and large and frequently repeated doses have to be given if an effective concentration of the antibiotic is to be aminatained in the blood and tissues. Intramuscular injection provides the most useful mode of administration.

Enzymatic Inactivation - An enzyme, penicillinase, splits penicillin to give penicilloic acid. The ability to produce penicillinase is one of the reasons why an organism may not be sensitive to penicillin- the tubercle bacillus and resistant strains of Staph. aureus,for example are penicillinase producers. A mixed infection due to a number of bacterial species, only one of which produces penicillinase may be completely resistant to penicillin because the enzymes released by one species protects all the others.

Hypersensitivity Reactions to Penicillin - The reaction is an anaphylactic one reminiscent of serum sickness but it may appear in those who are apparently being exposed to the drug for the first time. In these instances it has to be assumed that the patient has become senstized as a result of a pregious contact of which he wasunaware. One possibility is that he may have drunk milk from an animal which has itself received penicillin.

Anaphylactic responses to penicillin not infrequently have a fatal outcome. Penicillin may provoke re-

actions less violent than a fully blown anaphylaxis. The most common are skin rashes, they may appear in those who only handle the drug.

Skin testing has been recommedned but some authorities claim that this method does not adequately identify hypersensitive individuals. Moreover, a few instances are known of patients in whom the skin testing procedures has itself precipitated a fatal anaphylaxis.

No twithstanding their serious nature, anaphylactic responses represent anidiosyncratic reaction attributable more to the patient than to the drug.

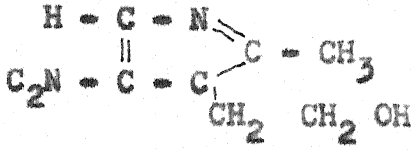
High osmotic pressures develop in bacterial cells. The ingress of water, with consequent lysis is prevented by the cell wall, a substantial structure which forms up to one fifth of the dry weight of the cell. Penicillin interferes with the formation of the cell wall of the developing micro-organism and thus exposes it to the lytic action of any solution whose osmotic pressure is less than that of the cell's own contents.

Penicillin probably interferes with the synthesis or the activity of an enzyme that controls the incorporation of muramic acid peptides into the structure of the cell wall. The production of the peptides themselves may also be interfered with.(Lewis's).

METRONIDAZOLE

It is a potent amoebicide and is highly effective by mouth as well as parenterally (by intravenous infusion)

Apart from the Entamoeba histolytica, it is also effective against non-sporing anaerobes (bacteroides), Trichomonas vaginalis and Giardia lamblia.



Metronidazole

Metronidazole is adequately and rapidly absorbed from the gut. It crosses the placental barrier andis present in milk. It is partly metabolized in the body and after large doses, the metabolites may impart a dark color to the urine.

The adverse reactions are mild and seldom necessitate discontinuation of therapy. Nausea, anorexia and metallic taste in the mouth are fairly common. The drug may produce an antabuse like reaction characterised by flusing, nausea and vomiting in some patients after the intake of alcohol.

The recommended dosage of metronidazole for Amoebiasis is 200 - 400 mg orally three times daily for 7-10 days. For anaerobic infections (bacteroides), it is given rectally as suppositaries in the dose of 1 gm eight hourly if the patient is nil orally or 500 mg thrice daily as slow intravenous infusions and 200-400 mg three times daily by mouth (if patient is orally allowed) for 7-10 days.

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MATERIAL & METHODS

MATERIAL AND METHODS

This study was carried out in M.L.B.Medical College Hospital, Jhansi from July, 1987 to August, 1988. It includes cases of infective peritonitis admitted in the indoor surgical wards of M.L.B. Medical College Hospital, Jhansi. Infective peritonitis was diagnosed on the basis of clinical features, radiological examination and per-operative findings. In all the cases detailed clinical history was taken and the cases was urgently investigated, whenever possible.

Selection of patients

The patients were studied in two groups -

Group I - Control group (Laparotomy without continuous peritoneal antibiotic lavage).

Group II - Study group (Laparotomy with continuous peritoneal antibiotic lavage).

Cases were so selected that every alternate case was treated with peritoneal lavage thus avoiding any discrimination.

Group I - Control group

These cases of infective peritonitis were treated in the conventional manner i.e. supportive fluid therapy, antibiotics, electrolyte therapy and supportive drugs but

no post operative lavage was done. The source of contamination in the form of perforation etd. was dealt with as in the other group. The peritoneum was cleaned mechanically to remove all pus and debris before closure of the abdomen. Only saline was used in this procedure.

Group II - Study group

The patients in this group were treated in the conventional manner, that is, supportive fluid and electrolyte therapy, antibiotics, supportive drugs. The cause of peritonitis for example, perforation, gangrene or anastomotic breakdown was dealt with accordingly.

The peritoneal cavity was cleaned mechanically and with repeated saline washings. Adhesions were broken down so as to eliminate all hiding places for bacteria and to ensure that the whole of the peritoneal cavity is bathed with the lavage fluid. The final peroperative lavage was done with normal saline containing the same antibiotic combination which was to be used in the post operative lavage.

Now two large drainage tubes were inserted in the peritoneal cavity, one placed in the hepatorenal pouch and the second in the pelvis. The abdomen was closed thereafter.

After the operation continuous peritoneal lavage was started. Normal saline solution mixed with one of these antibiotics combinations was run in the doses as enumerated below.

Six pints of normal saline was run for the first 24 hours following operation through the drainage tube placed in the hepatorenal areas.

The lavage solution was run simultaneously through this tube and drained via the tube in the pelvis into a sterile bag. Normal saline solution was run into the peritoneal cavity by using sterile tubings.

The lavage was stopped after 24 hours. The drainage tubes were left in situ for 24-48 hours. A large asepto syringe after creating negative pressure was connected to the tubes alternatively so as to suck out the excessive fluid. The drainage tubes were removed after no significant soakage resulted.

The two antibiotic combinations used were -

i) C. Penicillin, and metronidazole.

ii)Streptopenicillin and metronidazole.

Doses were -

C.Penicillin - 10,000,00/500 ml.

Streptomycin - 200 mg/500 ml.

Metronidazole- 1000 mg in 24 hours.

Procaine penicillin - 400,000 units/500 ml.

The antibiotic combinations used parenterally in dosages as clasculated according to body weight were Ampicillin, Gentamycin, Chloromycetin & Metronidazole in different combinations, as was necessary.

Alternatively rubber tubes (Malecot catheter) can be used as drainage tubes after making 2-3 holes, so as to ensure adequate drainage. The catheter placed in the pelvis was of a bigger size.

The study dates from July 1987 to August 1988 and is carried out to -

i) Evaluate the utility of continuous peritoneal lavage in reduction of morbidity and mortality in infective peritonitis.

ii) Find out a suitable antibiotic combination for continuous peritoneal lavage.

iii) To note complications of continuous peritoneal antibiotics lavage, if any.

PROFORMA

Name of the patient | Age/Sex

Ward/Bed | Surgeon Incharge

Date of admission | Date of operation

Date of discharge | Result

History

1. Present illness with emphasis on the source of infection:
   - Following surgery
   - Accidental
   - Following instrumentation
2. Past, family and personal history
3. Dietic history

Physical Examination

A. General

GC	Temperature
Pulse	Anaemia
B.P.	Jaundice
Cynosis	Oedema
Lymphnodes	Dehydration
Clubbing	

B. Systemic Examination

C.V.S.
C.N.S.
Respiratory system
Abdomen

Provisional diagnosis

Investigations

General : 1. Blood - hb% , T.L.C., D.L.C., P L E M

2. Urine, Albumin, Sugar, Microscopic

3. Specific, (where required)

- Blood Sugar
- Blood urea
- Smear examination of pus/discharge
- Plain X-ray abdomen in erect posture.
- Operative culture swab.
- Post lavage culture swab.

Operation

- Laparotomy with or without post operative lavage
- Only drainage of peritoneal cavity plus lavage.

Antibiotic combination

i) C.Penicillin and metronidazole

ii) Streptopenicillin and metronidazole

Post operative progress

i) Range of temperature

ii) Return of intestinal peristalsis

iii)Complications if any

a. Stitch abscess

b. Partial wound dehiscence

c. Complete wound dehiscence

d. Faecal fistula

e. Residual abscess.

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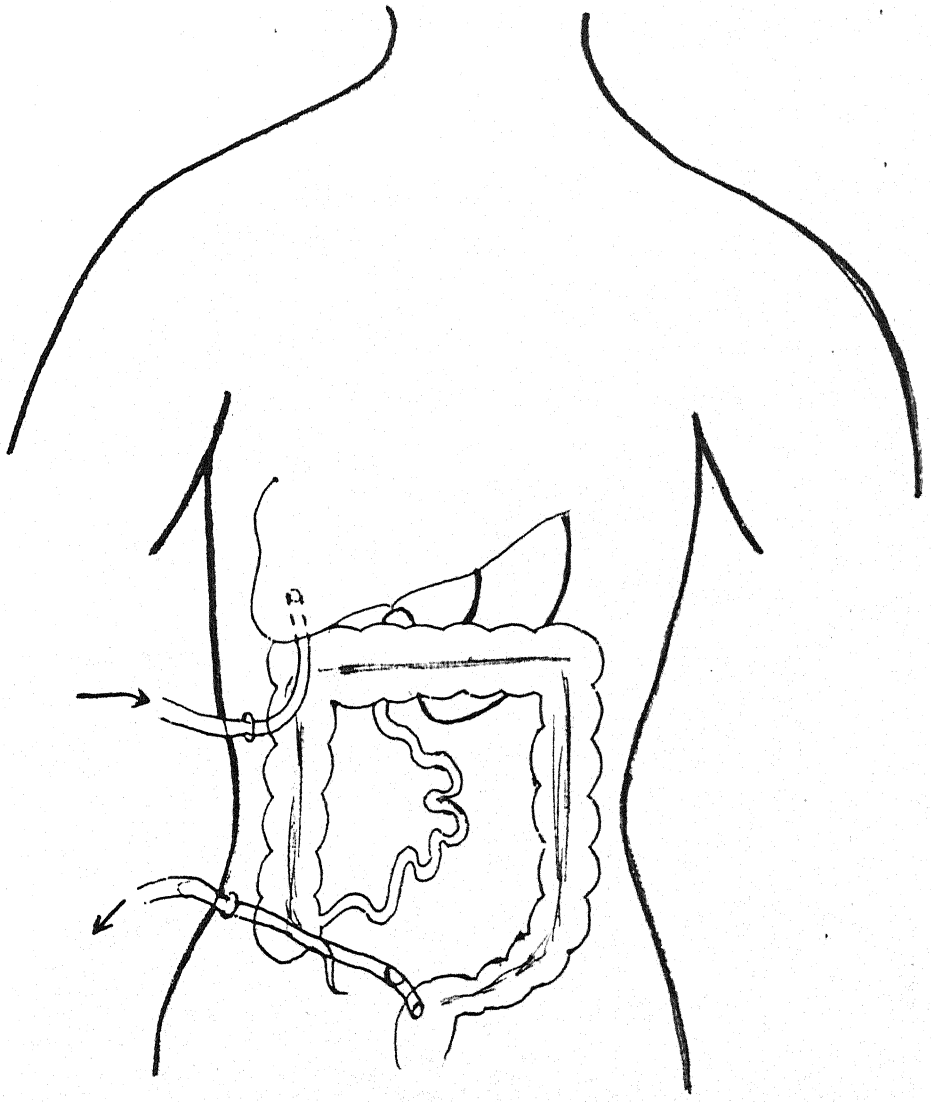

DIAGRAM SHOWING THE TWO DRAINAGE TUBES PLACED IN HEPATO-RENAL AND PELVIC AREAS.

OBSERVATIONS

OBSERVATIONS

This work highlights the findings of 60 cases of infective peritonitis admitted in Maharani Laxmi Bai Medical College Hospital, Jhansi from July, 1987 to August, 1988.

Table I

Age distribution

Showing distribution of cases according to age group.

Age in years	Number	Percentage
0 - 10	2	3.3
11 - 20	4	6.6
21 - 30	16	26.7
31 - 40	20	33.3
41 - 50	12	20.0
51 - 60	5	8.4
61 - 70	1	1.7
Total	60	100.00

The above table shows the distribution of cases according to age group. Maximum cases were seen in age group of 21-30 and 31-40, the percentage being 26.7% and 33.3% respectively.

Table II

Showing sex incidence in relation to age groups.

Age in years	Males		Females	
	No.	%	No.	%
0 - 10	1	2.5	1	5.00
11 - 20	2	5.0	1	5.00
21 - 30	12	30.0	4	20.00
31 - 40	17	42.5	8	40.00
41 - 50	4	10.0	4	20.00
51 - 60	2	5.0	1	5.00
61 - 70	2	5.0	1	5.00
Total	40	100.00	20	100.00

In this study 66.7% of the cases were males while 33.3 cases were females. In both the groups maximum incidence of cases fell in 21-30 and 31-40 years of age groups.

Table III

Causes of infective peritonitis

Showing causes of infective peritonitis and their incidence.

Causes	Total cases	
	Number	Percentage
1. Gastric Perforation	2	3.3
2. Duodenal perforation	9	15.0
3. Enteric perforation	36	60.0
4. Appendicular perforation	6	10.0
5. Traumatic perforation	4	6.7
6. Miscellaneous	3	5.0
Total	60	100.00

The above table shows the various causes of infective peritonitis. The incidence of enteric perforation was highest (60%) and that of duodenal perforation came next to it (15%).

Table IV

Temperature range

Showing temperature range in study and control groups.

Temperature range in °F	Study group		Control group	
	No.	%	No.	%
Normal	12	48.0	2	12.5
99 - 100	6	24.0	3	18.7
100.2 - 101	4	16.0	4	25.0
101.2 - 102	2	8.0	6	37.5
102.2 - 103	1	4.0	1	6.3
103.2 - 104	-	-	-	-
Total	25	100.00	16	100.00

The above table shows the temperature range in patients of study and control groups. The temperature was observed in the post operative phase 24 hours after laparotomy. Patients who died are not included.

In the study group, out of a total of 30 patients 25 patients (83.3%) survived of whom 12 patients (48%). regained normal temperature within the first 24 hours in contrast to the control group in which out of a total of 30 patients, only 16 patients (53.3%) survived of whom only 2 patients (12.5%) were able to regain normal temperature within the first 24 hours.

Table V

Recovery of post operative intestinal peristalsis

Showing recovery of intestinal peristalsis
(Evidence by appearance of bowel sounds)
in two groups.

Days (of appearance of bowel sounds)	Study		Control	
	No.	%	No.	%
2 days	6	24.0	1	6.3
3 days	14	56.0	3	18.7
4 days	3	12.0	2	12.5
5 days	2	8.0	8	50.0
More than 5 days	-	-	2	12.5
Total	25	100.00	16	100.00

Table V, shows the time in days elapsed after laparotomy for recovery of intestinal peristalsis. 80% cases in the study group recovered normal intestinal peristalsis by the 3rd day, whilst bowel sounds were heard in only 25% cases in the control group. Bowel sounds appeared in 50% cases in the control group on the 5th day. Cases which died are not included.

Table VI

Complications of infective peritonitis

Showing incidence of complications.

Complications	Study		Control	
	No.	%	No.	%
Stitch abscess	2	6.6	2	6.6
Partial wound dehiscence	3	10.0	4	13.3
Complete wound dehiscence	-	-	3	10.0
Faecal fistula	3	10.0	10	33.3
Residual abscess	2	6.6	3	10.0
Total	10	33.3	22	73.3

The table shows the incidence of various complications as seen in the study and control group.

Table VII

Mortality rate

Showing the mortality rate in study and control group.

Group	No.of patients	Mortality	
		No.	%
Study	30	5	16.6
Control	30	14	46.6

Incidence in study group is = 16.6%

while in the control group it is = 46.6%

Table VIII

Mortality with different antibiotic combinations

Showing mortality with two antibiotic combinations.

Antibiotic combination	No.of cases	Mortality	
		No.of deaths	%
C.Penicillin & metronidazole	15	3	10.0
Strepto-penicillin & metronidazole	15	2	6.6
Total	30	5	16.6

The above table shows the mortality rate with the use of the two antibiotic combinations. There is no significant difference between the mortality rates.

Table IX

Mortality in relation to duration of infective peritonitis

Showing duration of infective peritonitis before hospitalization and its relation to mortality.

Duration of peritonitis before admission	Study			Control		
	No.	Deaths	%	No.	Deaths	%
Upto 24 hours	6	1	16.6	5	1	20.0
1 - 2 days	16	1	6.2	19	8	42.1
3 - 4 days	8	3	37.5	6	5	83.3

Table IX, shows the mortality in relation to the onset of illness and start of definitive treatment. It is seen that mortality in the control group is as high as 83% when the patient is admitted after 3-4 days of start of infective peritonitis whereas in the study group the mortality is much less being 37.5%. The mortality is nearly the same in both groups when the patient is admitted within 24 hours.

Table X

Hospital stay

Showing hospital stay in the two groups.

Hospital stay in days	Study		Control	
	No.	%	No.	%
0 - 10	3	12.0	1	6.2
11 - 14	14	56.0	2	12.5
15 - 21	6	24.00	9	56.3
More than 22	2	8.0	4	25.0
Total	25	100.00	16	100.00

This table shows that the hospital stay in the study group was much less than that in the control group.

Maximum number of patients (56%) could be discharged after 11 to 14 days stay in the hospital in study group whereas approximately same number (56.3%) were discharged after hospital stay of 15 to 21 days in the control group.

Patients who died are not included.

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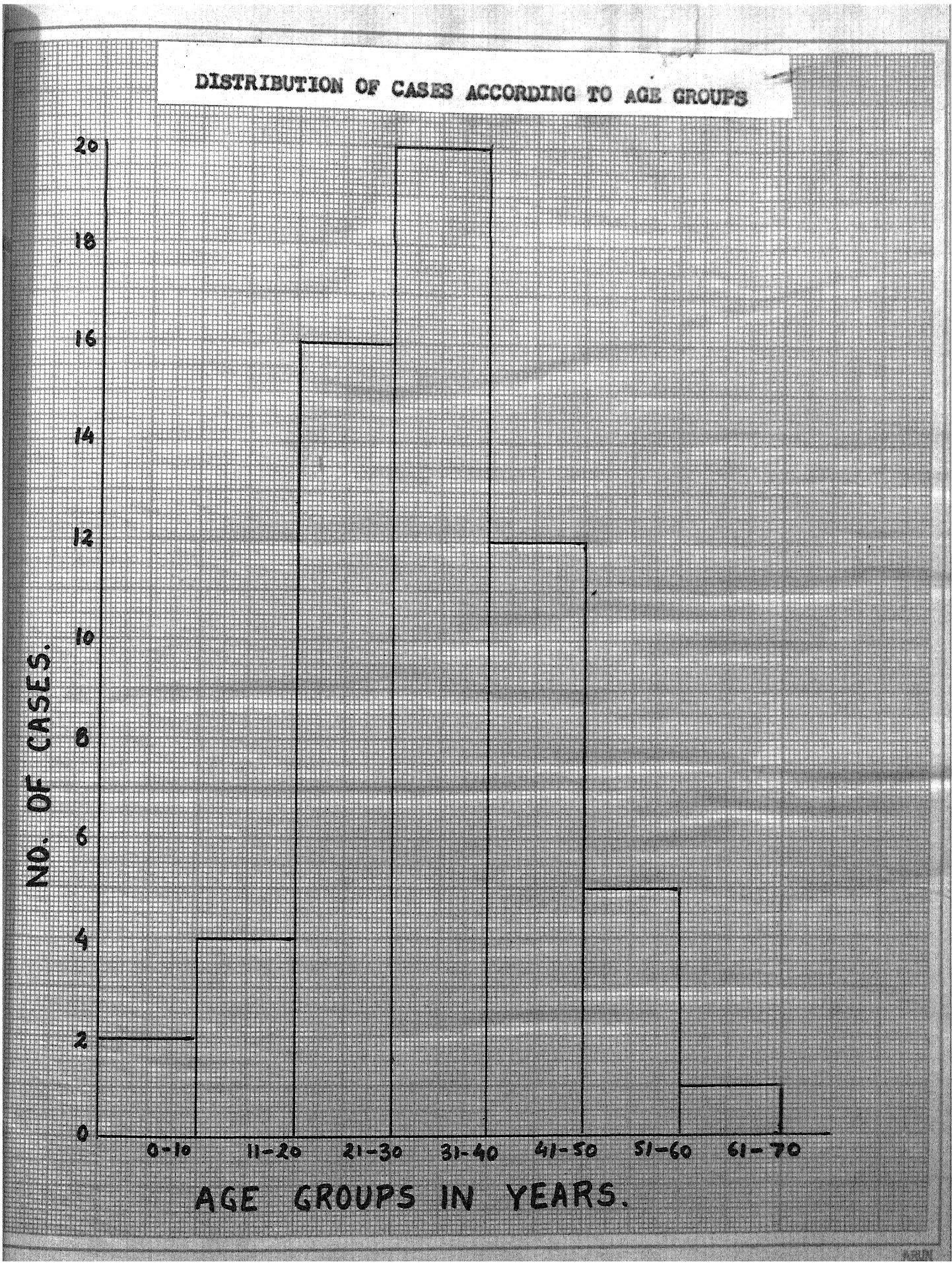
DISTRIBUTION OF CASES ACCORDING TO AGE GROUPS
NO. OF CASES.
20
18
16
14
12
10
8
6
4
2
0
0-10
11-20
21-30
31-40
41-50
51-60
61-70
AGE GROUPS IN YEARS.

CAUSES OF INFECTIVE PERITONITIS AND THEIR INCIDENCE

INCIDENCE OF COMPLICATIONS

MORTALITY RATE IN STUDY AND CONTROL GROUPS

MORTALITY RATE WITH THE TWO ANTIBIOTIC COMBINATIONS

DISCUSSION

Extensive peritonitis is usually associated with septicemia, toxaemia, oliguria and usually runs a fulminating course. A profound toxicity usually ensues, with extensive inflammation of the peritoneum. Cellular destruction results in the release of numerous vasoactive amines, which have a profound local and systemic effect. The above factors account for the extensive morbidity and mortality associated with infective peritonitis.

This study has been conducted on the cases of infective peritonitis admitted in Maharani Laxmi Bai Medical College Hospital, Jhansi. We have compared the conventionally treated patients (Control group) with patients treated conventionally plus peritoneal lavage (Study group) so as to evaluate the utility of continuous peritoneal antibiotic lavage in reduction of mortality and morbidy in infective peritonitis.

AGE GROUP

No age is free from the ravages of infective peritonitis, which was seen even in the first and seventh decades of life. Infective peritonitis was seen commonly in young adults. In our study the disease was most commonly found in the age group 31-40 years, with a percentage of 33.3%. Next common was the age group 21-30 years 26.7%.

The youngest patients was an 8 year old child whilst, the eldest was 67 year old man with peritonitis following appendicular perforation (Table I).

SEX INCIDENCE

In our series of cases there was male predominance over females, 66.7% cases were males, while females constituted only 33.3%. In both males and females the maximum incidence of peritonitis was found in the age group 31-40 and 21-30 (Table II).

CAUSES OF INFECTIVE PERITONITIS

In the present study we found the commonest lesion leading to infective peritonitis was Enteric perforation accounting for 36 of the 60 cases studied (60%). The incidence of enteric perforation was higher in males as compared to females.

The other common cause was duodenal perforation (15%) which far outnumbered gastric perforation (3.3%). Males were afflicted much more than females.

Post traumatic perforations causing peritonitis accounted for 6.7% of the cases but understandbly, males out numbered the females.

In the miscellaneous group three cases of burst liver abscesses (amoebic & pyogenic) were seen (Table III).

FEVER

Stephen and Loewenthal (1979) in their clinical trial of peritoneal antibiotic lavage found that majority

of their patients remained afebrile during the period when lavage was going on. The same was observed in our study. Majority of the patients receiving continuous peritoneal lavage remained afebrile during this 24 hours period and thus, experienced a sense of well-being.

We further studied the range of temperature in the control and study groups. This was done 24 hours after laparotomy was performed. It was seen that the temperature range was much lower in the study group. Maximum number of patients (12 (48%), who were treated with lavage had a normal temperature while only 2 (12.5%) in the control group had a normal temperature.

According to Wall (1965) most of the toxic substances produced in peritonitis were watersoluble and dialyzable and could be readily removed by lavage. This explains the lower temperature range in the study group (Table IV).

ANTIBIOTIC COMBINATIONS

The two antibiotic combinations which were used in peritoneal lavage in this study were -

i) C. Penicillin and metronidazole.

ii)Strepto-penicillin and metronidazole.

These combinations were chosen since they effectively cover a wide range of gram positive and gram negative organisms including the bacteroids.

Artz et al (1962) in a study of experimental peritonitis on dogs found that the use of an antibiotic combination of C. Pencillin and Kanamycin was more effective in reducing mortality than either antibiotic used alone. In their series Pencillin produced a survival of 63%, Kanamycin produced a survival of 60%. When both antibiotics were combined a survival rate of 100% was found. In the present study both of the above antibiotic combinations were found to be almost equally effective.

RECOVERY OF POSTOPERATIVE INTESTINAL PERISTALSIS AFTER LAVAGE

Severe peritonitis is associated with severe fluid and electrolyte imbalance and a disordered acid base state. Kelly and Vest (1952) have shown that lavage of the peritoneum with a balanced salt solution rapidly restores these metabolic derangements. This is highlighted in our study by the fact that in our lavage group, in 56% of patients bowel function returned by the 3rd day after laparotomy whilst, in the control group most of the patients (50%) regained bowel function only on the 5th day. In 24% of patients of the study group bowel sounds were heard on the 2nd day but in the control group only 6.3% regained bowel function by the 2nd day. 12.5% of patients regained bowel function after the 5th day in the control group, (Table V).

INCIDENCE OF COMPLICATIONS

The morbidity from infective peritonitis was appreciably reduced by continuous peritoneal lavage. In the study group out of 25 patients 6.6% developed stitch abscesses,

10% developed partial wound dehiscence and none had complete wound dehiscence. Faecal fistula developed in 10%cases. Residual abscesses occured in 6.6% cases.

In comparison to the above, in the control group the morbidity was much more. 6.6% developed stitch abscess. A high incidence of partial wound dehiscence (13.3%) was seen. Complete wound dehiscence accounted for the morbidity of 10% of cases. Faecal fistula and residual abscesses were very common in this group affecting 33.3% and 10% of the cases respectively.

The incidence of stitch abscess is seen to be same in the control group and in the study group I.e.6.6%

Mackenna et al (1970) had conducted a similar clinical trial and found similar results. They succeeded in reducing the morbidity significantly as also seen in our study. This can be seen by the fact that the number of complications was much less in the study group as compared to the control group (Table VI).

MORTALITY

In the present study the mortality in the two groups was -

Study group - 16.6% (5 patients out of 30).

Control group-46.6% (14 patients out of 30).

Thus it is seen that peritoneal lavage has succeeded in reducing the mortality to less than half.

The above result is similar to that obtained by Mackenna et al (1970). They succeeded in reducing the mortality to 20% by using antibiotic peritoneal lavage. Mortality in their control group was as high as 60%.

Stephan and Loewenthal (1979) also reported a decrease in mortality. By peritoneal lavage they managed to reduce the mortality to 22.2% from 50%.

The mortality rate in our control group was lower in comparison to Mackenna (1970) and Loewenthal (1979). This may be because the average age of the patients in our series was much lower (33.5 years), as compared to a higher age in the studies of the above two authors. In Mackenna's study the average age of patients in the control group was 71 years (Table VII).

MORTALITY ACCORDING TO ANTIBIOTIC COMBINATIONS

In our series we found that the mortality was not significantly different with the use of the two different antibiotic combinations. With the C.penicillin & metronidazole , 3 patients out of 15 died showing a mortality rate of 10%. With the streptopenicillin and metronidazole combination 2 patients out of 15 (6.6%) died. This conforms with the conclusion of Artz et al (1962) who found that there was no significant difference between any of the antibiotic combinations which they used in experimental peritonitis (Table VIII).

MORTALITY IN RELATION TO DURATION OF INFECTIVE PERITONITIS

Mortality in infective peritonitis depends a lot on the time elapsed between onset of illness and institution of treatment, as the amount of peritoneal contamination increases with time. 53.3% of cases in the study and 63.3% in the control group came to hospital between 1-2 days after onset of symptoms.

There was a striking difference in the mortality of the two groups in patients coming after 24 hours. Peritoneal contamination was more in these patients. In the study group the mortality was considerably less (20%) as compared to the control group (52%). There was no significant difference in the patients presenting within 24 hours (16.6% in study and 20% in control).

This gives credence to the belief that lavage is more effective in cases with gross intraperitoneal contamination as pointed out by Stephen and Loewnthal in 1979. There is no significant difference in survival in patients with lesser degrees of contamination (Table IX).

HOSPITAL STAY

The length of the hospital stay of the patients depends upon the morbidity due to the illness. In the present study there was a significant difference in the hospital stay of the patients in study and control groups. While more than half of the patients in study group were discharged within

14 days of their admissions (68%), in control group only 18.7% could be discharged in the same period. In control group majority were discharged after 14 days (75%). (Table X).

COMPLICATIONS OF LAVAGE

No systemic complications due to continuous peritoneal antibiotic lavage were found in the patients. There was no incidence of over hydration or toxicity due to antibiotics.

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CONCLUSION

CONCLUSIONS

In the present study of 60 patients of infective peritonitis admitted in Maharani Laxmi Bai Medical College Hospital, Jhansi from July, 1987 to August, 1988, the following conclusions were drawn -

1. Incidence of infective peritonitis was high in young adults Maximum number of cases of infective peritonitis was found in the age groups 21-30 and 31-40, the percentage being 26.7 and 33.3 respectively.
2. Males were found more commonly affected than females. The percentages were 66.7 and 33.3 respectively. Here again, maximum incidence was found in the age groups 21-30 and 31-40.
3. Amongst the causes of infective peritonitis, enteric perforation (60%) and duodenal perforation (15%) were most common.
4. Post operative temperature range was much less in the study group (treated with lavage) as compared to control group. 48% of patients in the study group had normal temperature, whereas this percentage was only 12.5 in the control group.
5. Recovery of post operative intestinal peristalasis was much faster in the study group. In majority of the patients (56%) in the study group bowel sounds were heard by the third day, whilst in the control group (50%) of patients regained bowel functions by the 5th day.

6. Morbidity was less in the study group. The incidence of partial wound dehiscence and complete wound dehiscence was 10% and zero percent respectively in the study group and 13.3% and 10% respectively in the control group. Faecal fistula and residual abscess were found in 10% and 6.6% of cases in the study group, while in the control group these two complications were found in 33.3% and 10% of cases respectively.
7. The number of complications was much less in the study group as compared to the control group.
8. Peritoneal lavage managed to reduce mortality by more than half. In the study group mortality was 16.6% whilst in the control group it was 46.6%.
9. Peritoneal lavage was seen to be more effective in cases with gross intraperitoneal contamination. In patients in whom definitive treatment could be started only after 24 hours (due to the patients coming late for hospitalisation) of onset of illness the mortality in the study group was 16.6% in the control group, the mortality was as high as 52%.
10. No significant difference was noted in the mortality in patients with lesser degrees of peritoneal contamination. In those patients who were admitted within 24 hours of onset of illness the mortality was 16.6% and 20% respectively in the study and control group.

11. The mortality rate did not vary significantly with the use of different antibiotic combinations. In the C.Penicillin - Metronidazole group, 3 patients out of 15 (10%) diedwhile 2 patients out of 15(6-6%) died in the Strepto-penicillin metronidazole group.
12. The morbidity in terms of hospital stay of the patients was less in the study group. Majority of the patients (68%) in the study group, were discharged within 14 days of their hospitalization. In the control group 75% of patients were discharged after 14 days.
13. Continuous peritoneal antibiotic lavage did not produce any systemic complications like over hydration or toxicity due to the various antibiotics used.

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ROLE OF CONTINUOUS ANTIBIOTIC PERITONEAL LAVAGE IN POST-OPERATIVE CASES OF INFECTIVE PERITONITIS

SUMMARY

THESIS

FOR

MASTER OF SURGERY

(GENERAL SURGERY)

BUNDELKHAND UNIVERSITY
JHANSI (U. P.)

PANKAJ GUPTA

1989

SUMMARY

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Infective peritonitis is a disease which still causes much sufferings and death despite the advances of medicine. It thus necessitated the evolvement of some procedure which could, if not totally abolish, decrease the morbidity and mortality in such cases.

The concept of mechanical cleansing of the peritoneal cavity using lavage at the time of operation was first advocated by Nolan (1893) and Price (1905). Since the bacteria harboured in the pus in the peritoneal davity are the main culprits causing morbidity and mortality, hence it gave the idea of mechanically lavaging the peritoneal cavity through a continous drip of sterile solution post operatively.

Past studies have shown that the continuous lavage of the peritoneal cavity has succeeded in checking the morbidity and mortality rates to some extent. Various types of solutions and antibiotic combinations have been used for lavage so far with varying results.

The present study of continuous Antibiotic peritoneal lavage in post-operative cases of peritonitis conducted in Maharani Laxmi Bai Medical College and Hospital which dates from July 1987 to August 1988 was undertaken to:-

1) Evaluate the utility of continuous peritoneal lavage in reduction of morbidity and mortality in infective peritonitis.
2) Find out a suitable antibiotic combination for continuous peritoneal lavage.
3) Note the complications of continuous peritoneal antibiotic lavage, if any.

Forty males and twenty females constituted the group of sixty patients included in this study. The patients were divided into following two groups -

Group I - Control group - in whom laparotomy without continuous antibiotic peritoneal lavage was done.

Group II- Study group - in whom laparotomy with continuous antibiotic peritoneal lavage was done.

The control group cases were treated in the conventional manner i.e. exploratory laparotomy was performed; the cause treated surgically and abdomen closed without any continuous peritoneal antibiotic lavage. Other supportive measures like fluid therapy, antibiotics electrolyte inbalance etc. were taken care of in the usual manner.

In the study group cases, apart from the conventional method of treatment, continuous antibiotic

peritoneal lavage was carried out. Two sterile drainage tubes (alternatively, Malecot's catheter) were used. One was inserted in the hepatorenal space through which the antibiotic solution was run, and the other was placed in the pelvic cavity which drained the solution that ran down after bathing the peritoneal cavity contents. This was carried out for 24 - 48 hours till the fluid in the drainage tube appeared clear, after which the lavage was stopped.

-The fluid used was normal saline and the two different antibiotic combinations used in it were -

i) Crystalline penicillin and metronidazole

ii) Streptopenicillin and metronidazole

By this technique it was seen that the post operative temperature range was much less in the study group (treated with lavage) as compared to control group. 48% of patients in the study group had normal temperature after 24 hours of operation as compared to only 12.5% in the control group.

Recovery of post operative intestinal peristalsis was much faster in the study group. 56% of the patient in the study group regained bowel sounds by the third post operative day as compared to only 18.7% in the control group.

Post operative complications in terms of stitch abscess partial and complete wound dehiscence, faecal fistula and residual abscess were much less in the study group.

In the present study, continuous antibiotic peritoneal lavage successfully managed to reduce the mortality by more than half. In the study group mortality was 16.6% (5 patients died out of 30) whilst in the control group it was 46.6% (14 patients died out of 30).

Thus it is concluded that continuous antibotic peritoneal lavage is a very useful and a simple procedure that has succeeded in reducing the morbidity and the mortality in cases of infective peritonitis to a significant degree. Also, it does not carry any risk of systemic complications like over hydration and antibiotic toxicity when carried out thoughtfully.

It abbreviates the hospital stay of the patient with consequent decrease in the expenditure by the patient for the management.

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